

Researching State Highway Culverts to Determine Impacts on Threatened and Endangered Salmon

Purpose for the Research

Salmon and steelhead are important economic and social resources for the people of California. However, due to declining numbers many of these fish populations are listed as threatened or endangered under the Endangered Species Act.

To reach the habitats they need for survival and successful reproduction, many salmon and steelhead must pass through culverts under roads of the state highway system. Culverts function to effectively move water downstream under a road thus, protecting the road. They also need to allow both adult and juvenile fish to freely pass both upstream and downstream. Thus, fish passage through culverts is a major concern for Caltrans.



Improperly designed culverts can prevent fish from reaching necessary habitat leading to declines in sensitive populations. For instance, blocked passage may prevent juvenile fish from reaching food. Or, fish may be prevented from reaching cool water summer refugia and slack water winter refugia. Impassible culverts may sever populations reducing the genetic diversity both upstream and downstream of the culvert. Fires, floods and other disasters may destroy fish populations upstream of a blockage and migrants will not be able to reoccupy the habitat as conditions improve.

Caltrans sponsored research to identify state highway culverts that block passage of salmon and steelhead and develop a prioritized list of state highway culverts needing to be replaced or repaired to facilitate fish passage to help meet the Department's needs in this area. This project is part of a much larger cooperative effort to improve fish passage throughout California.

Research Methods

The study was performed by a research team from Humboldt State University directed by Dr. Margaret M. Lang. The geographic limits of this study were Del Norte, Humboldt, and Mendocino Counties in Caltrans District 1. More than 800 miles of state highway were evaluated and 411 potential fish passage sites were identified. Seventy-eight sites were eliminated because the streams did not support fish. The research team surveyed and analyzed three-hundred-twelve sites using the California Department of Fish and Game's assessment protocol to identify potential impediments to fish passage including high water velocities, low water depths and excessive leaps over the range of fish passage flows. Twenty-one sites likely to be important to fish were not surveyed because landowners denied access permission. The research team prioritized each site by assigning a score or value for the following criteria at each crossing location: species diversity, extent of barrier, average value of crossing sizing and current condition, and habitat. The total score was the sum of the four criteria.

Conclusions

The final result of the fish passage assessment for state highway culverts is a prioritized list of sites needing remediation

or replacement. Twenty-five top priority locations were identified. Many streams have multiple crossings requiring watershed-scale assessment of barriers and cooperation between landowners to eliminate the barriers to fish passage. Identifying watersheds affected by two major road owners, Caltrans and the counties, is a major first step to watershed-based fish passage assessment.

Recommendations

The priority list for stream crossing remediation on State Highways in Caltrans District 1 is not a definitive order for which remediation projects should be planned but guidance for identifying sites needing remediation. Habitat quality and quantity is a major factor in the prioritization process but given the access requirements for stream habitat surveys currently in place these values cannot be easily obtained. Full-scale habitat surveys are recommended for those sites ranking high on the prioritization list and having only map estimates of habitat quantity. Cost is also a factor and the cost for remediation varies greatly among sites. Passage problems at low slope or slightly perched outlet sites can likely be addressed by in-barrel and outlet modification without complete crossing replacement. These sites will likely present more opportunities for remediation than sites requiring full replacement. Stream crossing sites are rarely static; they respond to processes that alter the crossing's function over time. Thus, site status and the prioritization lists will need to be periodically updated to reflect both site changes over time and to reflect completed remediation projects.



For further information on this project please contact:

Harold G. Hunt
Senior Environmental Planner
Materials and Infrastructure Research
1101 R Street
Sacramento, CA 95811
Phone: (916) 324-2903
Fax: (916) 324-2669
harold_hunt@dot.ca.gov